Interacting with a telepresence robot: mobility, space and embodied practices

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Interacting with a telepresence robot:

mobility, space and embodied practices

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Telepistemology: Descartes' Last Stand by Hubert L. Dreyfus

”

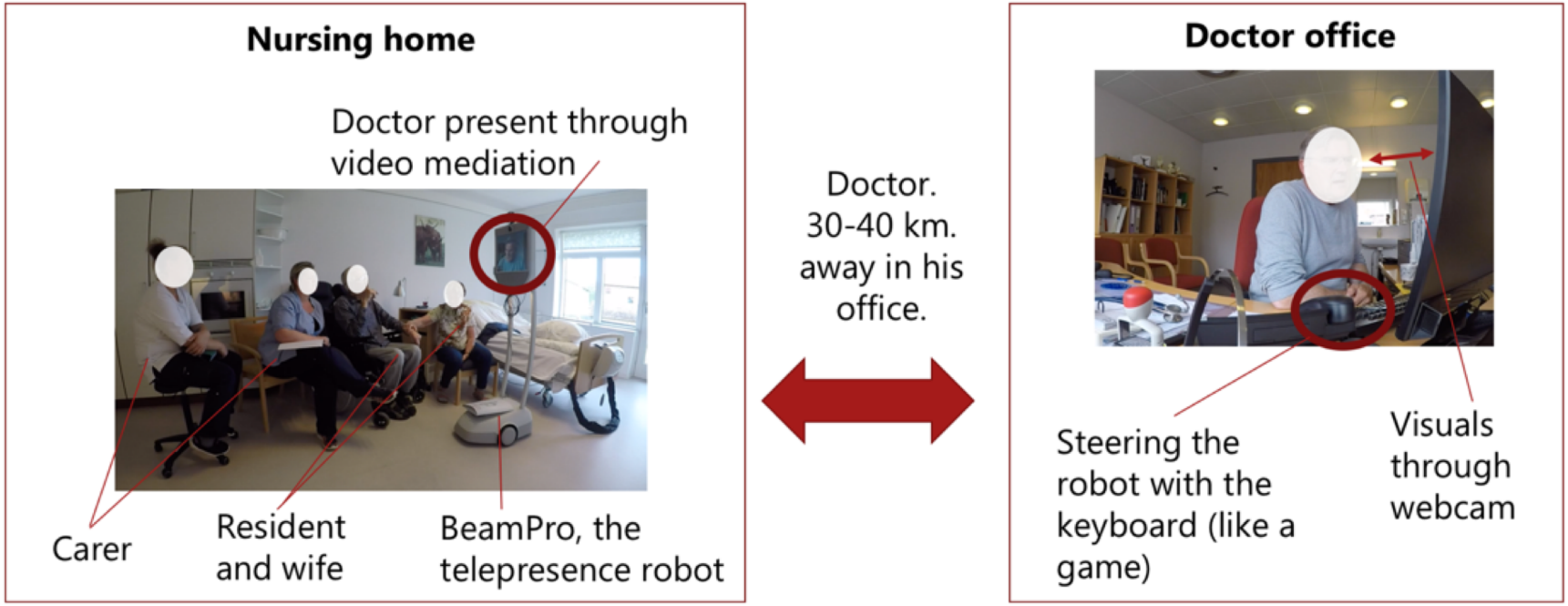
She could see the image of her son, who lived on the other side of the earth, and he could see her.…"What is it, dearest boy?" …"I want you to come and see me." "But I can see you!, she exclaimed. "What more do you want?" …"I see something like you …, but I do not see you. I hear something like you through this phone, but I do not hear you." The imponderable bloom, declared by discredited philosophy to be the actual essence of intercourse, was ignored by the machine.

He may have a point. But what are the actual practices today? How do people manage to establish some kind of presence nevertheless?

Artists see far ahead of their time. Thus in the twenties E. M. Forester envisioned a future in which people all over the world would be able to keep in touch with everything electronically. They would sit in their rooms all their lives, talking to each other and seeing each other, as well as receiving medical care from distant robots, and so forth. Naturally, they developed pale, lumpish bodies that they hated and, on those rare occasions when they met face to face, it was considered as great *faux pas* to touch or be touched by another person.

Which resources are used for establishing intersubjectivity in a telepresence mediated setting?

- Telecommunication in business, government and healthcare in Denmark.
- Nursing home. A doctor is virtually present through a telepresence robot (BeamPro).



Cyborgism? Man+machine in social interaction. What is it?

- **Cyborg.** Clynes & Kline (1960): "cybernetic organism" is a being with both organic and biomechatronic body parts.
- **Andy Clark on cyborgs:** cognition: part biological, part mechanical system. Extended mind.
- **Donnah Haraway on cyborgs:** politics: genderless, race-less, more collective and peaceful civilization
- **Michel Callon:** human/non-human hybrids, fixed integrations.
- **Tim Dant:** ethnographic, man-machine assemblages that goes apart again.
- **Emic EMCA perspective**: it is what it is from a members perspective.

Neil Harbisson has an antenna surgically implanted into his skull, which picks up nearby light waves and converts them into sound, allowing him to "hear" color.

- Callon, M. (1990). Techno-economic Networks and Irreversibility. *The Sociological Review*, *38*(1_suppl), 132–161. https://doi.org/10.1111/j.1467-954X.1990.tb03351.x
- Clark, A. (2004). *Natural-Born Cyborgs: Minds, Technologies, and the Future of Human Intelligence* (1 edition). Oxford University Press.
- Clynes, M. E., & Kline, N. S. (1960). Cyborgs and Space. *Astronautics*.
- Dant, T. (1999). *Material culture in the social world: values, activities, lifestyles*. Open University Press.
- Haraway, D. (1991). A Cyborg Manifesto. Science, Technology, and Socialist-Feminism in the Late Twentieth Century,. In *Simians, Cyborgs and Women: The Reinvention of Nature (ed.) Haraway*. Routledge.

Mediated interactions
EMCA, videoethnography & HCI/HRI

What are the naturally occurring practices – the spatial and embodied organization - of a mobile telepresence robot?

Naturally occurring

Human Computer Interaction (HCI)
Human Robot Interaction (HRI)
Interface design / Technology development

- Suzuki, R., Kobayashi, Y., Kuno, Y., Yamada, T., Yamazaki, K., & Yamazaki, A. (2016). Maintaining Formation of Multiple Robotic Wheelchairs for Smooth Communication. *International Journal on Artificial Intelligence Tools*, *25*(5), 1640005.
- Yamazaki, A., Yamazaki, K., Ohyama, T., Kobayashi, Y., & Kuno, Y. (2012). A techno-sociological solution for designing a museum guide robot: Regarding choosing an appropriate visitor. In *2012 7th ACM/IEEE International Conference on Human-Robot Interaction (HRI)* (pp. 309–316).

EM/CA-inspired research program on mediated interactions

Arminen, I., Licoppe, C., & Spagnolli, A. (2016). Respecifying Mediated Interaction. *Research on Language and Social Interaction*, *49*(4), 290–309.

E.g. Participants use of VC or Google Glass

- Licoppe, C., & Morel, J. (2018). Visuality, text and talk, and the systematic organization of interaction in Periscope live video streams. *Discourse Studies*, 1461445618760606.
- Luff, P., Heath, C., Yamashita, N., Kuzuoka, H., & Jirotka, M. (2016). Embedded Reference: Translocating Gestures in Video-Mediated Interaction. *Research on Language and Social Interaction*, *49*(4), 342–361.
- Due, B. L. (2015). The social construction of a Glasshole: Google Glass and multiactivity in social interaction. *PsychNology*, *13*(2–3), 149–178.

Focus on technology

Focus on practices

"Normal science"

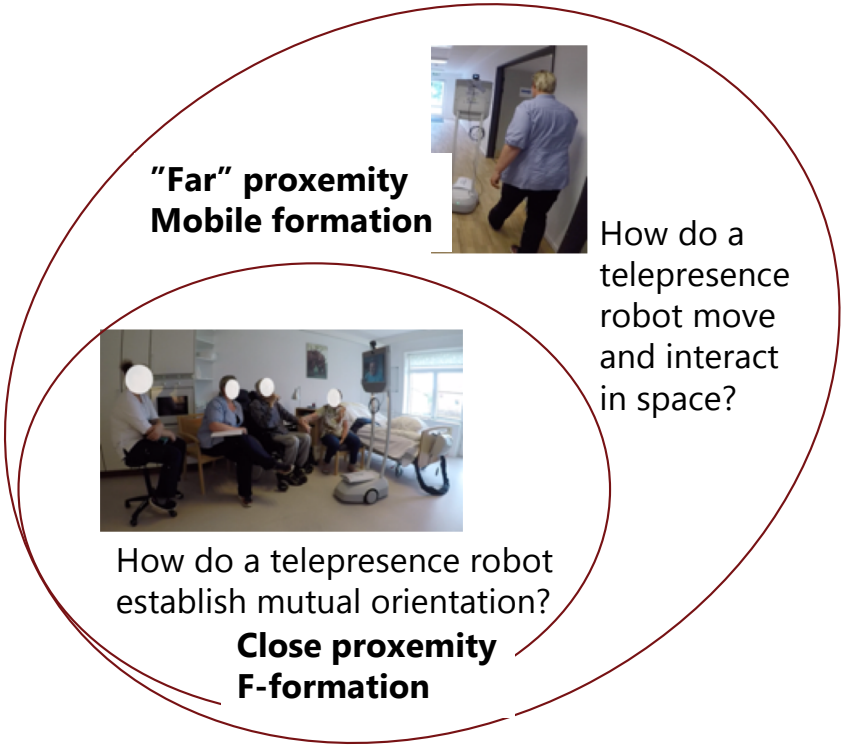
Testing technology, e.g. new software / hardware

Due, B. L., Kupers, R., Lange, S., & Ptito, M. (2017). Technology Enhanced Vision in Blind and Visually Impaired Individuals. Synoptik Foundation research project. *Circd Working Papers in Social Interaction*, *3*(1), 1–31.
Luff, P., Heath, C., Kuzuoka, H., Hindmarsh, J., Yamazaki, K., & Oyama, S. (2003). Fractured Ecologies: Creating Environments for Collaboration. *Human-Computer Interaction*, *18*(1), 51.

Experimental

Two practices that separates the telepresence robot from "normal" video-mediated interaction.

Work in progress



Analysis 1: "Machine/Head" orientation + space
Analysis 2: Space
Analysis 3: "Machine/Head" orientation

Cross references. Embodied ressources, head/gaze

Ford, C. E., & Stickle, T. (2012). Securing Recipiency in Workplace Meetings: Multimodal Practices. *Discourse Studies*, *14*(1), 11–30.

Goodwin, C. (1980). Restarts, Pauses, and the Achievement of a State of Mutual Gaze at Turn-Beginning. *Sociological Inquiry*, *vol:50 hft.:3-4*, 272.

Kendrick, K. H., & Holler, J. (2017). Gaze Direction Signals Response Preference in Conversation. *Research on Language and Social Interaction*, *50*(1), 12–32.

Licoppe, C., & Morel, J. (2018). Visuality, text and talk, and the systematic organization of interaction in Periscope live video streams. *Discourse Studies*,

Mondada, L. (2009). Emergent focused interactions in public places: A systematic analysis of the multimodal achievement of a common interactional space. *Journal of Pragmatics*, *41*(10), 1977–1997.

Cross references. Mobility & space

Broth, M., & Keevallik, L. (2014). Getting Ready to Move as a Couple Accomplishing Mobile Formations in a Dance Class. *Space and Culture*, *17*(2), 107–121.

Due, B., & Bierring Lange, S. (2018). The Moses Effect: The Spatial Hierarchy and Joint Accomplishment of a Blind Person Navigating. *Space and Culture*, *21*(2), 129–144.

Goffman, E. (1963). *Behavior in Public Places: Notes on the Social Organization of Gatheri*. see notes for publisher info.

Hall, E. T. (1966). *The Hidden Dimension*. New York: Anchor.

McIlvenny, P., Broth, M., & Haddington, P. (2014). Moving Together Mobile Formations in Interaction. *Space and Culture*, *17*(2), 104–106.

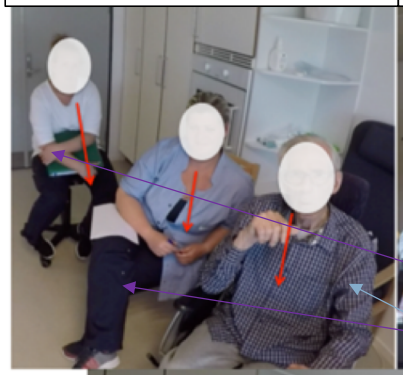
Scheflen, A. E. (1976). *Human Territories: How We Behave in Space-Time*. Englewood Cliffs N.J.: Prentice-Hall.

Technical setup

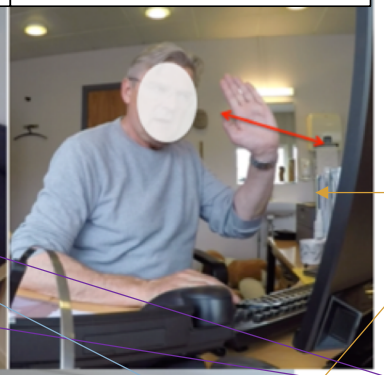
- Ethnographic knowledge of the setting. Interviews and observations.
- Institutional context; doctor-patient interaction. Asymmetry, professional identities.
- Multiparty interaction.
- Intertwined semiosis
- Three GoPro cameras
- About 10 hours of recordings

The mounted GoPro on the robot. Turned on by the researcher. The kind of visuals, the doc has

The mounted camera at the doctors office. Turned on by the doctor.



figur 1



figur 2

The handheld camera of the researcher

figur 3

Doctor

Nurses

Patient/resident

Relative

Ex 1: Machine/head-orientation + spatial organization

Machine-head/gaze movability as a resource for establishing mutual orientation

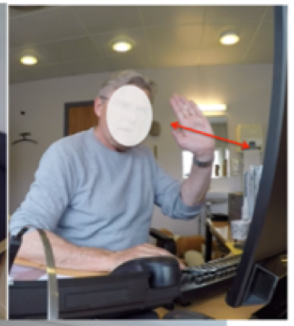
Verbally announcing a departure.
- Using "embodied words". No man-machine distinction

Verbal aligning response

Recipient-designed goodbye

1	NUR1	+[jo]	
		[yes]	
2	DOC	[så] gør vi det i morgen	Δ(0.7)Δ
		[then] we'll do that tomorrow (0.7)	
	lis	+>>touches leif's hand---------->	
	nur1		Δnods Δ
3	DOC	så jeg lister ud igen	
		then i'll sneak out again	
	lis	---------->	
4	NUR1	det er i orden	
		that's fine haha	
	lis	---------->	
5	DOC	*[leif #*ha det] godt min ven*	
		[leif take care] my friend	
6	NUR1	[hehe]	
		[haha]	
	lis	---------->	
	doc	*.....*raises hand----------*	
	fig	#fig1+2+3	

figur 1



figur 2

figur 3

Use of ordinary gestures with symbolic meaning; sequentially linked to the verbal goodbye (l. 5).

F-formation. Everybody has visible and embodied access to each other

Machine-head/gaze movability as a resource for establishing mutual orientation

Second pair part of the goodbye adjacency pair

Post expansion;
a) verbal specific recipient design (response to Lis goodbye l. 7)
b) Machine/head orientation
Sequentially linked: mutual orientation

Third position embodied response

7 LIS +ja Δhej hejΔ+
yes bye bye
lis ---------->
lis +looks at doc+
nur1 ΔnodsΔ

8 NUR1 hej
bye
lis ---------->

9 DOC og *[lis]
and [lis]

10 NUR2 [hej]
[bye]
lis ---------->
doc *start turning towards lis---->

11 DOC +os til [dig]*
to you [too]

12 LIS [ja]
[yes]
lis ---------->
lis +leans towards doc---------->
doc ---------->*

13 DOC (0.6) #*vi vi ses*
(0.6) i i'll see you
lis ---------->
lis ---------->
doc *raises hand in goodbye*
fig #fig4+5+6

figur 4

figur 5

figur 6

Reuse of symbolic gesture

Continuously mutual orientation through head direction and gaze

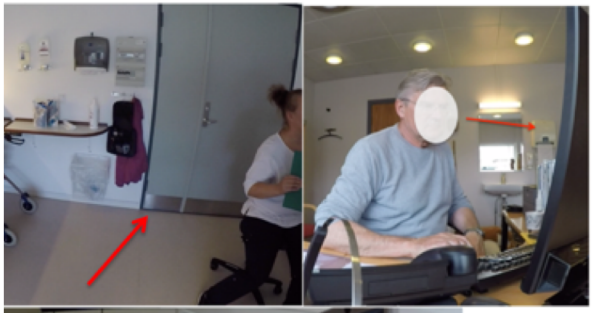
Machine-mobility as a resource for sequence closing; displaying nextness

Moves; projects leaving.

Produce recognizable trajectories

Recognizes Robo-docs turning and driving behavior as projecting moving through the door as next action

14	LIS	*ja Δ((laughs quietly))*++&Δ+*(1.0)& &(1.6)Δ+
		yes ((laughs quietly)) (2.6)
	lis	---------->+
	lis	---------->+
	lis	+scratches face--+
	doc	*turns towards door*
	doc	*drives towards door---->
	nur1	Δ.....Δstands up--------Δ
	nur2	&rolls chair back&
	nur2	&.....------->
15	NUR1	#vi kommer tilbage lige om &lidt Δ↑ik &% (0.4)*
		we'll be back in a moment ↑ok (0.4)
	doc	---------->*
	nur1	Δwalks towards door-------->
	nur2	---------->&opens closet&
	lei	%looks at camera---->
	fig	#fig7+8+9



figur 8

figur 9

A participant (robo-doc) moves → Change in contextual configuration

Implicitly addressing the man-machine configuration (Robo-doc)

Making a request "unusual" for a "normal" person

Accounted for in overlap

Making a joke / using irony

Treated as a laughable

Using "embodied words"

16 DOC er der nogen [der gider å:bne]
does someone [want to o:pen]

17 NUR1 [han kan ikke] &åbne døreΔ dog%&Δ
[he can not] open doors though

nur1 ---------->Δ
nur1 Δopens door----->
nur2 &.....&opens door------>
lei ----------%looks at lis---------->

18 NUR2 [ej det for dårligt]
[that's not good enough]

19 NUR1 [men meget kan han] [hahaha]
[but he can a lot] [hahaha]

20 LIS #Δ[hahaha]% *(0.4)Δ&
[hahaha] (0.4)

doc *turns---------->
nur1 ---------->Δ
nur1 Δwalks out through door---->
nur2 ---------->&
lei ----------%looks at door--->
fig #fig10+11+12

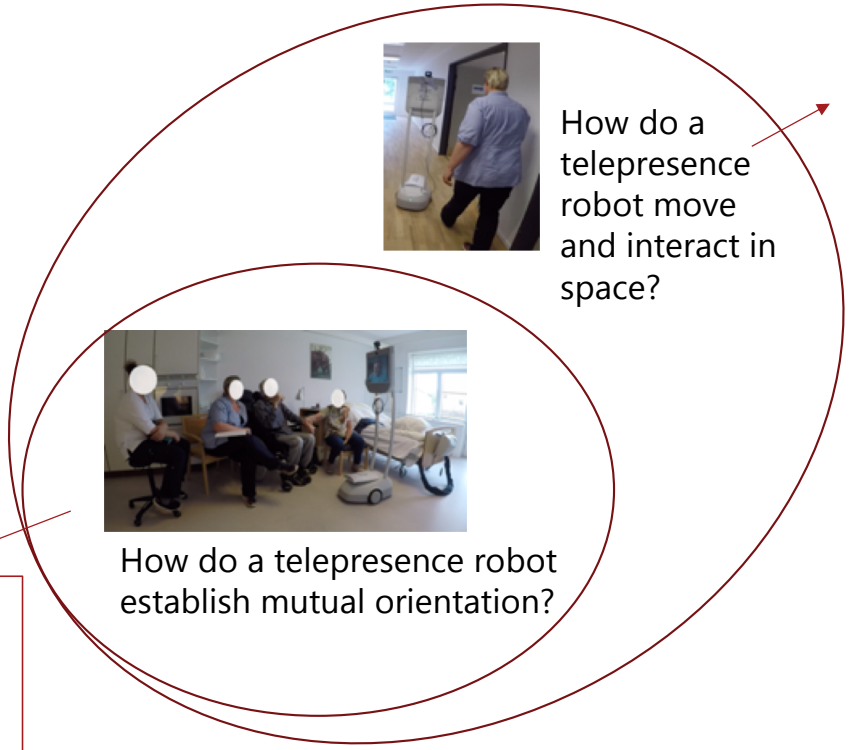
figur 11

figur 12

Navigating by using (mediated) gaze and fingers on the keyboard

Readjusting bodies, gazing and moving in space

Two practices that separates the telepresence robot from "normal" video-mediated interaction.



"Far" proximity
Mobile formation

- Projects next actions
- Produce recognizable trajectories

Close proximity
F-formation

- Using machine/head turning as a resource
- Construct an "I, robot" MCD

Ex 2: The organization of space and mutual positions

Opening sequence

Question design

Second pair part designed as a counter question

Third position: doc is machine-embodied accounting and begins moving before verbal alignment

1 DOC &er der nogen ting jeg skal vi:de inden vi går #ind& ((raises eyebrows))
is there anything I need to kno:w before we go in ((raises eyebrows))
nur2 &walks into the hallway----------&
fig #fig1+2+3

2 NUR ja (.)Δmen eh ka vi ikk::Δ Δgå lidt *afsidesΔ &[så]*
Yes (.) but eh can't we:: go somewhere secluded [then]

3 DOC [jo]
[yes]
doc *drives forward-----*
nur Δlooks behind shoulderΔ
nur ΔpointsforwardΔ
nur2 &looks at doc--->

Projects a different direction than Doc is driving

figur 1

figur 2

figur 3

Verbal instruction (after embodied projection (pointing))

4	NUR	*hvis du: ø:h &vender rundt*& *(0.1)* *(1.4)
		if you e:h turn around
	doc	*turns left----------*
	doc	*turns right*
	doc	*turns left--->
	nur2	---------->&
5	DOC	°ja°
		°**yes**°
	doc	---------->
6	NUR	og går ned a: (.)* #*Δgangen Δ(0.8)
		and walks down (.) the hallway (0.8)
	doc	---------->*
	doc	*drives------>
	nur	ΔpointsΔ
	nur	Δwalks behind doc----->
	fig	#fig4+5+6

gur 4 figur 5

figur 6

Pointing out of Docs visual field. Doc cannot see Nurse

Starts driving as a response.
Displaying recognition of which way to drive/go (turning right at hallway).

Stops driving.
Orienting to lack of visual guidance

Responds to machine-action by accounting for stopping; verbally and embodied.

7 DOC det kan vi sagtens* #*(2.3)* #*(1.8)* #*(2.1)* *(3.2)*Δ#
that we can easily do
doc ---------->*
doc *turns right*
doc *turns left*
doc *turns right*
doc *drives straight*
nur crossing from behind to the right side---------->Δ
fig #fig7 #fig8 #fig9 #fig10

8 NUR Δ*(0.9) jeg kommer #foran dig nu Δ↓morten*
(0.9) I am going in front of you now ↓morten
doc *turns left----------*
nur Δwalks in front of doc from left side ---------->
nur Δlooks behind shoulder--->
fig #fig11+12+13

9 DOC (1.0) *okay↘
(1.0) okay↘
doc *turns right-------->
nur ---------->
nur ---------->

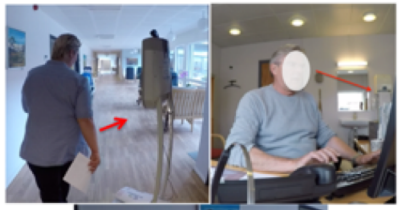

figur 11 figure 12


figure 13


figur 7 figur 8 figur 9 figur 10

Ex 3: Mutual orientation using Machine/head turning

figur 1

figur 2

figur 3

1	DOC	+det gjorde jeg
		I did that
	lis	+>>strokes leif's hand-------->
2	NUR1	+jaer ↓ # *+(0.4)+(0.6)
		yes ↓ (1.0)
	doc	*turns towards lis--->
	lis	---------->
	lis	+turns head at doc+
	fig	#fig1+2+3

Sequence closing

Initiates next action by start turning; addressing Lis through the machine

While simultaneously talking to and turning towards Lis, Doc is projecting her as a next relevant speaker

figur 4

figur 5

figur 6

3 DOC ø:hm ↓ (.) lis det her forløb det kommer til at ta nogen uger*# Δ(0.5)
u:hm ↓ (.) lis this process is going to last some weeks (0.5)
doc ----------->*
lis ----------->
nur1 Δlooks down-->
fig #fig4+5+6

4 LIS ja ↓
yes ↓
lis ------->

5 DOC men hvor meget kanΔ du fortælle mig hvor meget havde leif tabt sig her sidste tid
but how much can you tell me how much weight had leif lost lately
lis ----------->
nur1 ---------->Δ

Findings: compensation strategies

- **Fractured ecology**. Limited semiotic resources. Like in VC: verbal and camera-directed visible resources are available.
  - showing recognizable symbolic gestures (waving goodbye)
  - establishing (some kind of) mutual gaze
  - showing facial expressions
- **Compensation**. Compensating for the lack of some embodied modalities by using other possibilities to accomplish intersubjectivity. Building action by joining together different kinds of resources (co-operative action) (Goodwin, 2017). Establishing some kind of co-presence, although not "intercorporiality" (cf. Dreyfuss). The possibility of mobility affords more actions than VC alone.

Findings: the accomplishment of intersubjectivity

- **Space and mobility**
  - Far space properties. "Untied" behavior. Moving around enables / affords mobility and "empower" the doctor. It is a vital resource for the sequential organization (e.g. having the opportunity to sequence closing (leaving the room) ex1) and the establishment of the professional identity, (requesting professional knowledge, ex2). Cf. Mobile formations. Getting in position (e.g. "moving as a couple" (Broth), "emergent focused interaction" (Mondada)). Producing trajectories. Monitoring movements.
- **Establishment of mutual orientation**
  - Near space properties. Establishing F-Formation. Telepresence robots occupy a position in space similar to bodies because of the physical form. Multimodal achievement of common interactional space. Co-constructed and adjusted to the emergent contextual configuration in F-formations.
  - Machine-projections. The robot is in situ accomplishing machine-actions (turning, moving) that projects other actions (e.g. next speaker selection (ex 3)). It is controlled by the doctor, and is thus – for all practical purposes – a mediated extension of the doctors bodily actions.
  - Enabling mutual orientation. Turning the screen is a vital resource for the sequential organization, the establishment of the professional identity, and the accomplishment of intersubjectivity. Cf. Goodwin, 1979 p. 99. "Rule 1: The gaze of a speaker should locate the party being gazed at as an addressee of his utterance.". Machine-head/gaze apparently follows the same rule.

Findings: respecifying *cyborgisme* as a naturally occurring category

- **"Anthropomorphism"**: Using "embodied words". The robot is treated as the doctor and vice versa = I (he) am the Robodoc. References to the spatial properties: able to be mobile qua "being" a telepresence robot.
  - Ex 1: "I'll sneak out" (l. 3), "he can not open doors" (l. 17)
  - Ex 2: "go somewhere" (l. 2), "you turn around" (l. 4), "walks down the hallway (l. 6).
  - Framing: "who will walk" versus which will drive"
- **What is it? It is what it is**: 100% doctor with professional epistemic and deontic authority and 100% robot with limited socio-material affordances ("he can not open doors").
  - Membership Category with category bound activities. **Doing-being-robodoc**: producing professional doctor-actions verbally and machine embodied.

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"

True presence may never be achieved (e.g. touching), but the technology affords new mediated possibilities, that participants are able to use in locally, situated and innovative ways to accomplish the necessary tasks.
- Mobility ads significantly to the "sense of presence".

so forth. Naturally, they developed pale, lumpish bodies that they hated and, on those rare occasions when they met face to face, it was considered as great *faux pas* to touch or be touched by another person.

THANK YOU

BRIAN DUE
UNIVERSITY OF COPENHAGEN